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Keynote Address for the 4th Symposium on the Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations

As prepared for delivery

I appreciate the invitation to participate in the *4th Symposium on the Impacts of an Ice-Diminishing Arctic on Naval and Maritime Operations*.

Thank you, Dr. Pablo Clemente-Colon, and everyone at the National Ice Center and the U.S. Arctic Research Commission for putting this event together.

We are pleased that Alaska's senators, Lisa Murkowski and Mark Begich, will be here tomorrow to provide Congressional perspectives on Arctic changes.

And my special thanks to the NOAA folks speaking throughout the symposium. I'm proud to have strong participation by NOAA throughout the program. I'm pleased that Monica Medina, principal deputy under secretary for oceans and atmosphere, will be here tomorrow speaking on *NOAA's Arctic Vision and Strategy*.

It is a great pleasure for me to be back, talking with NOAA's partners in the Arctic region, including our Canadian and Russian friends, and partners from the Navy and Coast Guard, with whom we share the National Ice Center and many other ocean policy interests.

I look forward to building on these partnerships to maximize our efforts for sustainable Arctic use.

When I spoke at the 3rd Arctic Ice Symposium in 2009, I had just been confirmed as the NOAA Administrator. My remarks focused on NOAA's Arctic science and the urgent need for collaborative action to deal with growing issues in an ice-diminished Arctic.

I've personally witnessed dramatic changes in the Arctic – in Alaska, Greenland and Svalbard. Changes seen in the skies and on the land, on and under the water, and on and under the ice. Changes described eloquently by native peoples and documented by keen observers and scientists.

A few months after the 2009 symposium, I traveled to various parts of Alaska with then-Coast Guard Commandant Thad Allen and others from the President's Ocean Policy Task Force to take stock of Arctic coastal and ocean issues. I was again struck by the dramatic pace of change, its impact on native populations (people and wildlife), the lack of basic information and services that we take for granted in the lower 48, and the opportunity for scientific information to make operating in an uncertain environment safer and to help ensure that new uses can be sustained through time without eroding core environmental services.

That is a tall order anyplace, but in an environment with volatile changes and an increasing pace of change, it is formidable.

Evidence of climate change is abundantly clear in the Arctic: Permafrost is thawing. Arctic sea ice is

being lost at unexpected rates, and shorelines are eroding. People's lives and livelihoods are being impacted.

As sea ice retreats and the Arctic becomes more accessible, cascading needs for information, readiness, response and assistance are created. Pressure is increasing on the Navy and Coast Guard to maintain a "response-ready" presence there for safety and security. Native coastal communities are requesting assistance in relocating entire villages or burial grounds, information about likely changes in whales, seals and fish, and more accurate weather and oceanographic conditions. The maritime community is anticipating a future open Arctic trade route and is concerned about accurate navigation charts, weather and disaster forecasts and emergency response capacity. And the fossil fuel industry is seeking permitting approvals for oil and gas exploration in the Chukchi and Beaufort Seas for 2012, with increasing information needs concerning potential impacts, behavior of oil in frigid waters, and appropriate response capacity.

These activities and others mean that NOAA is inundated with increasing requests for timely weather forecasts and disaster warnings, more comprehensive and current navigation charts, tide tables, and elevation data, improved oceanographic information, and more baseline data on protected species and ecosystems. In other words, the loss of sea ice alone creates new opportunities, potential threats and new demands for information and services to evaluate trade-offs and ensure safety. And, of course, the loss of sea ice interacts with the plethora of other changes underway that influence Arctic ecosystems, communities, and cultures.

These changes affect not only the Arctic. They have global implications as well. The Arctic not only acts as a thermostat stabilizing the Earth's climate and regulating global temperature, but also as a barometer of change.

Fortunately, Arctic policies are beginning to catch up with scientific and indigenous knowledge. The 2009 National Security Presidential Directive 66 sets a broad framework for U.S Arctic Region Policy. President Obama's 2010 National Ocean Policy clearly identifies federal response to "Changing Conditions in the Arctic" as a major priority and lays out an ecosystem-based, stewardship approach. And the recent successes on the international front with the Arctic Council's search and rescue agreement, ecosystem-based approaches, and collaborative research partnerships that U.S. science agencies are building with sister Arctic nations are indicators that we are beginning to confront these Arctic issues together.

These directions are an excellent beginning, but more holistic approaches are needed if we are to achieve the multiple goals identified for the Arctic.

There are numerous things we can do to confront, learn from, mitigate, and adapt to an ice-diminished Arctic. Guiding principles provide useful framing for decisions to help achieve success. Many principles are articulated in various policy documents, but I would emphasize the following 6 guiding principles.

First, when in doubt, err on the side of caution, especially when actions may trigger irreversible changes or ones affecting huge areas or lasting for decades to centuries. A stellar example comes from the North Pacific Region Fishery Management Council, who decided in 2009 to prohibit expansion of commercial fishing in U.S. federal waters in the Beaufort and Chukchi Seas until the scientific basis for fisheries management decisions could be established.

Second, adopt an ecosystem-based management approach that considers the interacting and collective impacts of diverse activities on the functioning of the Large Marine Ecosystems of the Arctic. This holistic approach recognizes that sectoral activities, such as shipping, energy production, mining, fishing, tourism, and defense, affect one another and ecosystem functioning. In lieu of a sector-by-sector, activity-by-activity, or species-by-species approach, the ecosystem approach allows a more integrated and useful understanding. If the goal is to use Arctic ecosystems without using them up, an integrated, ecosystem approach is necessary. This approach is also more streamlined and enables a more predictable environment for all users.

Third, the people of the Arctic should have a strong voice in their future. At the same time, decisions must recognize that many changes in the Arctic will have global ramifications. Just last week, two listening sessions for the National Ocean Policy , one in Barrow and one in Anchorage, reinforced the importance of incorporating multiple local perspectives into decision-making.

Fourth, the challenges of operating and living safely in the rigorous and quickly changing Arctic environment require extra attention to safety, adequate communications, contingency plans, and vigilance.

Fifth, management and policy decisions should be firmly grounded in scientific information, with adequate attention to acquiring, disseminating and using the requisite data and information.

Finally, collaborations, openness and transparency are essential for effective expansion of use of the Arctic.

With these principles in mind, I turn now to NOAA's role in achieving sustainable use of the Arctic and in supporting our partners -- governmental and non-governmental, US and international – in their missions. Many of the NOAA presentations later today and tomorrow will provide greater specificity on the topics below, so I will articulate only a broad overview.

Earlier this year, NOAA released its *Arctic Vision and Strategy*. This document complements NSPD 66, the National Ocean Policy and its Arctic Strategic Action Plan, and responds to the needs and requirements articulated by you, our partners and stakeholders.

The *Vision and Strategy* identifies priority areas where we think NOAA can make the most impact. It reflects our three core missions of science, services and stewardship.

NOAA's scientific capabilities can be deployed to increase research and understanding of climate and other key environmental trends, to predict the ecosystem responses to those trends, and to offer the technical expertise needed to develop policy options and management strategies for mitigation and adaptation to the environmental challenges in the Arctic region.

NOAA's service capabilities are needed to support safety and security needs for fishing, marine mammal protection, transportation, energy, infrastructure, and mineral exploration in the unique Arctic environment.

And **NOAA's stewardship mission** focuses on the goal of healthy oceans and coasts and healthy people, economies and cultures.

NOAA envisions an Arctic where decisions and actions related to conservation, management, and resource use are based on sound science and support healthy, productive, and resilient communities and ecosystems. We envision an Arctic where the global implications of Arctic change are better understood and incorporated into decision-making.

Toward these ends, we have prioritized areas to contribute most productively to Arctic security, maritime domain awareness, and maritime operations in general:

- First, sea ice forecasting and marine weather;
- Second, the foundational science, observations and models needed to detect Arctic climate and ecosystem changes; and
- Third, geospatial infrastructure in support of marine transportation, oil spill response, and community resilience.

On sea ice and marine weather

The need NOAA hears most often from our stakeholders – both government and private sector – is a need for better Arctic sea ice and marine weather forecasts and warnings to support real-time navigation and seasonal planning. The loss of sea ice affects marine access and safety, regional weather, ecosystem changes, coastal communities and emergency response.

But accurate forecasting depends on the ability of NOAA and its partners to deploy a variety of sensing devices— from buoys to airborne and satellite sensors. We need to do this more effectively, more strategically and at a faster pace.

Technology development is essential – such as for new platforms like Unmanned Aerial Systems that can withstand the rigors of the Arctic environment while collecting data more efficiently and cheaply.

Better sea ice and weather forecasts also depend on enhanced scientific research and modeling. We need to strengthen existing partnerships such as the National Ice Center, through our Earth System Research Laboratory in Boulder, through the National Weather Service Ice Desk in Alaska, and with the Navy for its oceanographic modeling capability, with NASA for our joint work on satellite development, with Canada for weather data sharing.

By committing to collaborate more effectively, we can begin to deliver on the accurate, quantitative, daily-to-decadal sea ice projections and improved weather forecasts that you need for safe Arctic operations and ecosystem stewardship.

On foundational science, observations, and modeling

No single region better exemplifies the complex interdependence of communities and changing ecosystem conditions than the Arctic.

In four of the last five years, we have witnessed the lowest sea ice extents on record, including a loss of at least one-third in multi-year ice extent, as well as a significant thinning of its mean thickness. Recent Arctic temperature increases are more than double those found at lower latitudes.

Furthermore, we are seeing shifts in ocean ecosystems from the Aleutian Islands to Barrow, and across

the Arctic Ocean, due to a combination of Arctic warming, natural variability, and sensitivity to changing sea ice conditions.

Understanding sea ice means understanding how climate change impacts physical conditions. Broad-scale biological observation means being able to see how a changing climate and environment will impact the food web and other aspects of the ocean ecosystem. Putting the two together gives us the baseline to evaluate the impacts of man-made changes to the equation, such as permitting new drilling activity.

However, NOAA's current climate modeling capacity is too gross to meet user needs for regional and local scales, and the uncertainties are large.

Similarly, it is beyond the scope of existing ecosystem models to provide reliable indications of how loss of sea ice and increasing ocean temperatures will impact key species such as pollock, cod, salmon, and crab, as well as ice seal species and Arctic cetaceans (e.g., bowhead, gray, humpback, and beluga whales).

To support our foundational science needs, we have to work together on many fronts to improve baseline observations and understanding of Arctic climate and ecosystems in order to reduce the uncertainty in assessing and predicting impacts caused by a changing Arctic. This support includes *in situ* and remote sensing observations, shipboard sampling, and long-term, community-based research on marine species. This also includes fostering partnerships with other agencies, states, academia, and the private sector, as well as with other nations, such as working with Canada on Extended Continental Shelf mapping and Russia for elements of a distributed biological observatory.

NOAA's recently signed new MOU with the Department of Interior's Bureau of Ocean Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) will facilitate development of baseline observations and environmental studies needed to assess Arctic drilling.

Leveraging these relationships to build sustained observations will enable researchers to study the effects of oil and gas exploration, sea ice loss, ocean acidification, and sea surface temperature warming on Arctic ecosystems over time. This information will inform NOAA's ecosystem stewardship, and will contribute to Coast Guard and Navy security risk assessments and the effective timing of Arctic military staging.

The third goal to note today is improving the Arctic geospatial infrastructure in support of marine transportation, maritime domain awareness, oil spill response, and community resilience.

Currently, Alaska has limited geospatial infrastructure; meters-level positioning errors; sparse tide, current, and water-level prediction coverage; obsolete shoreline and hydrographic data; poor nautical charts; little understanding of oil in ice; and inadequate oil-spill response capacity.

Why? Mostly because of limited resources and other priorities. We have the capability, but not the capacity.

Modernizing the Arctic geospatial framework will provide the foundation for many activities in the region, including Arctic security operations, effective climate adaptation, community and economic resilience, and safe marine transportation.

The low-hanging fruit: Collaboration on gravity data collection for accurate positioning and surveying and mapping are two relatively simple ways we can work together to build a robust geospatial framework.

By agreeing upon an integrated mapping standard and the smart use of our limited vessel capacity in Arctic waters, we can update data on maps and nautical charts – some of which dates back to the 1800s, before the region was even part of the United States.

NOAA is also working to build its spill response capacity to support Coast Guard first responders. For example, by building the same interactive online mapping tool for the Arctic as was used during the Gulf spill response. More commonly known in the responder world as the Environmental Response Management Application, or ERMA, this powerful tool could serve as the most significant, and perhaps only, scientific tool in responding to oil spills and pollution releases in the Arctic. NOAA and the Oil Spill Recovery Institute sponsored a workshop earlier this year with federal, state, indigenous communities, NGOs and industry stakeholders in Anchorage to discuss technical challenges and data collaboration. It is our hope to bring this technology online sometime next year, pending resources. We also know that ERMA is only as good as the information within it, so the sharing of new datasets to improve the platform is essential.

To conclude, the Arctic region is already experiencing significant climatic change.

What happens in the Arctic, does not stay in the Arctic.

Our national policies are beginning to catch up to this reality. However, our ability to deliver the technical and scientific information needed lags behind as a result of limited resources.

NOAA has diverse capabilities that can and should be brought to bear on the emerging environmental, economic, and national security issues in the Arctic – both to meet our own missions and mandates, and to help you meet yours.

You need us and we need you – domestic and international partners, Arctic residents and Native Alaskan communities. We all bring unique capabilities to the Arctic, but effective collaboration is needed to succeed in addressing the challenges of this valuable but vulnerable region.

Thank you again for your time today.